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Vacancy dynamics and reorganization on bromine-etched Si(100)-2x1 surfaces

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Abstract

Halogen etching of Si(100) surfaces has long been considered to involve the selective removal of atoms from an essentially static surface. However, a variable temperature scanning tunneling microscopy study reveals that vacancy sites produced by etching are mobile at elevated temperature and rearrange to form features that were considered to be the direct products of etching. We demonstrate that the different etch features observed at different temperatures are not due to different mechanisms. Rather, kinetic etch products formed at low temperatures are transformed into thermodynamically more stable features at higher temperatures.